



**Agricultural
Administration
Unit**

Overseas Development Institute
Regent's College Inner Circle
Regent's Park London NW1 4NS
Telephone: 01-935 1644

PASTORAL DEVELOPMENT NETWORK

Paper 22a
September 1986

DIRECTIONS IN CONTEMPORARY PASTORAL DEVELOPMENT

by

Jon Moris

ODI

INTRODUCTION

The pastoral development network exists principally as a means of information exchange. It allows field staff to compare experiences between countries and to see what researchers are thinking without awaiting eventual academic publication. For consultants and academic analysts, the network provides a forum for bringing new approaches and concepts to a wider audience. These purposes are served by the routine circulation of papers on specific topics, such as those accompanying this article.

However, at times it is also useful to pause for stocktaking (occasioned in this instance by a change in editorial responsibility for the network). What general lessons emerge from two decades of attempted assistance to pastoral peoples? Are there new concepts and approaches which can be applied within field studies? What are the likely directions for future research? This paper attempts to answer these three questions. It sets out some 15 major themes which seem relevant for understanding contemporary pastoral development. About half are generally applicable, and about half are specific to Africa. The themes which it is hoped future network papers may explore are:

1. How to compare systemic performance validly.
2. Cost-effectiveness of information acquisition.
3. The future of common property resources.
4. Why grazing blocks, group ranches and associations have failed.
5. Service delivery systems suited to livestock production.
6. How to identify promising technical interventions.
7. Dealing with seasonality and other constraints.
8. The Sahel conundrum: Are there technical solutions?
9. Recovery after drought: Policies and Experience.
10. The role of nonconventional species.
11. Labour and herding strategies.
12. Studying pastoralists' decision-making.
13. The impact of militarization.
14. Irrigation for pastoralists.
15. Consequences of sedentarization.

1. Measuring livestock performance for the purpose of comparing efficiency between systems requires careful thought about the parameters to be employed. It seems that much of the supposedly superior "efficiency" of modern technologies may be simply an artefact of the measurement methods employed. Behnke (1985) argues convincingly that when per animal measurements are so used, they reflect simply the advantages of lower stocking density (particularly when derived from research farms) rather than inherent systemic productivity. Many large-scale ranches in Latin America and Africa are under-stocked, giving magnificent figures on individual weight gains but a very misleading idea of overall systemic productivity. Similarly, the usual way of attaching farm-gate prices to livestock products can be quite misleading when applied to subsistence production, for reasons Behnke makes clear. The effect of this bias is to understate the value to producers of "subsistence" uses of their animals and animal products, making commercial "end sale" uses seem more attractive than they are in real-world transactions. Instead of attacking the conservatism of producers, then, a more appropriate target would be the conservatism of the evaluators who persist in attaching biased estimates to the output of the systems being appraised.

Conventional measurements employed in ecological studies, based on biomass produced per hectare (cf. results from the Sahel reported by Penning de Vries and Djitéye, 1982, and by de Ridder et al., 1982) give a quite different perspective on systemic productivity from the usual livestock production coefficients based on per-animal measurements. As indicated above, per animal measurements favour a low stocking density which gives heavy individuals but a lower per hectare biomass. Animal scientists accustomed to comparing weight gains per individual animal are like peasant farmers who prefer low plant populations in their maize fields: the result is a field of attractive, large plants at the expense of lowered total productivity. A further complication is introduced when we consider nutrient paths, which can be identified by looking at energy flow through the system (see Coughenour et al., 1985). There is also the problem created by extreme seasonalities (discussed later in this paper), which make it nonsense to employ aggregate seasonal means in comparing actual pro-

duction systems. And, of course, African systems generally require dealing with several species. Standardized conversion factors are by nature somewhat arbitrary, and can have a large impact upon the apparent "efficiency" of a given enterprise combination. They often also conceal implicit assumptions about what product is desired from the system. All in all, these complexities explain why evaluations based on any single criterion are likely to give quite misleading results when applied to assess animal production in the tropics. The danger is that researchers' "scientific" methodologies may predetermine the outcome of inter-systemic comparisons irrespective of actual variations in performance. More attention as to how comparisons are drawn would seem to be warranted (Fielding 1986, Cossins 1985).

2. How information is acquired in the field is also an issue, suggesting more scope for rapid appraisal methods in livestock development. In many countries, it is expensive and difficult to acquire necessary information about the livestock sector (particularly where there is a "traditional" or semi-nomadic component). National statistics on the traditional sub-sector are notoriously unreliable, and yet few projects can afford to conduct their own censuses to provide the data they need for project planning and evaluation. The varying costs and reliability of different methods merit more discussion (see network paper 22b and also several papers in ILCA, 1983).

One possibility at a national level is to make greater use of aerial counts, based on geographic sampling. In recent years, ILCA has put considerable investment into refining aerial census methods for counting livestock and human populations, using techniques taken over from wildlife biologists. Here the main difficulty appears to be the seasonal movements of people and animals. While these are easily documented, they remain unexplained from the visual data base. ILCA is also exploring the cross-referencing of data acquired at varying scales, ranging from remotely sensed satellite imagery down to ground surveys done by Landrover (de Leeuw and Milligan, 1983; Henriksen 1986).

At the micro level, individual projects may require data on herd composition (by species, age and sex) as well as on ownership, stock movements, densities, demographic aspects, the utilization and disposition of animals, and returns. Sociologists need information on labour requirements and herding strategies (discussed below), while range ecologists may need to document forage utilization and watering frequencies. Since in much of Africa (and to a lesser extent in parts of Asia), animals are moved seasonally across national borders, it may be difficult to obtain reliable information.

Disciplinary traditions also enter the picture. As pointed out above, the analytic models applied in economic appraisal tend to undervalue subsistence production (Behnke 1985), and may fail to distinguish between users and owners of animals. Such aspects can be extraordinarily difficult to unravel within field studies. What has been learned so far is mostly negative. Detailed ethnographic accounts of pastoral social organization usually do not address the key issues of concern to policy-makers, just as the aggregate census data do not show how production returns are distributed within the human population. These methodological pitfalls explain why the earlier "systems describing" field studies sometimes devoted a huge effort to producing unreliable and noncomparable data bases. More carefully formulated strategies which take into account the cost-effectiveness of acquiring information and which allow results to be cross-related between different disciplines are urgently required (Sanford 1977).

3. Common Property Resources emerge as a growing concern in many countries. It is fairly clear from the historical record, particularly in recent times, that a spontaneous enclosure of what were formerly common property resources is taking place. Sometimes this process is accelerated by official programs for land reform, e.g. in parts of Latin America, Africa (Kenya), and South Asia. Such developments remove from the system the very land which is most crucial, being the better watered segments which usually are central to the survival of livestock during the dry or winter seasons. Once triggered off at the local level, the process can occur very rapidly; within a decade or less a major redistribution of resources may take

place. This is not in and of itself worrying, except that the poorer half of the population often are not in a position to safeguard their entitlement and so may lose access to grazing and water which they have enjoyed for generations. Furthermore, as Jodha's case (1985) from the arid zone of India demonstrates, the impact of land reform (and other measures) may be quite different in regard to livestock production from its effect in other sectors. Unintended consequences may impose negative costs nobody anticipated (see Francis, 1986, on Nigerian land law). Among economists there is a vigorous debate about common property resources, yielding diverse theories for which pastoral situations constitute a much-needed empirical test (Peters 1985).

Several policy issues emerge with respect to the role of common property resources in livestock production: i) what kind of managerial system to apply to minimize 'tragedy of commons' situations, ii) what legal system might safeguard users' existing entitlements as the national economy becomes more commercialized, iii) how to monitor and if necessary control emergent trends, and, iv) how to recognize the differential importance of common property resources to various categories of producers.

4. Grazing blocks, group ranches, and ranching associations have often been adopted in the past as devices for incorporating traditional pastoralism into the contemporary national economy. Research by Oxby (1981), ILCA, Moris (1981) and other network members makes it clear these institutional innovations have hardly ever yielded the expected benefits. Most earlier attempts by the colonial governments, and later by the UNDP and USAID in the 1960s, had so little impact they cannot even be located accurately today. And yet there continue to be proposals for the formation of still more group ranches and grazing blocks (cf. Nigeria's grazing reserves). It is apparent the enthusiasm does not arise from the pastoralists themselves, but instead originates from outsiders or from the national level, where it is felt the semi-nomadic way of life is doomed and must be superseded by some form of settled ranching. Of course, range scientists can use the implicit notion of controlled stocking rates to defend the supposed benefits to be realized from group ranches, just as sociologists

can argue for the need to give producers a voice in their own development.

The fact is, however, that formation of viable group organizations among pastoralists requires an enormous input of liaison and re-education. Until there are at least a few examples of enduring, economically successful units, it would be rash indeed to expect the new units will have any better record than those formed in the past. What policy makers require is a critical re-thinking of the whole issue of how best to bring pastoralists into the modern economy. Perhaps group or cooperative ranches are desirable, as a means to safeguard pastoralists' legal rights to their traditional grazing. Even then, much more will be necessary if these are to stand any chance of success. Governments require assistance from pasture agronomists and others to devise less extensive forms of ranching, perhaps based on 50 to 100 hectare units to accommodate the resources a large compound actually controls. Maybe it would be cheaper to issue the heads of compounds with barbed wire, and let them settle the matter in their own way.

5. The question of the design of service delivery systems for livestock producers should be put on a more systematic basis. In the past, many African departments concerned with livestock development were headed by veterinarians. Animal treatment and the establishment of disease free areas for export-oriented production were accorded high priority. It was also assumed that high quality, therapeutic services were necessary and desirable. These premises have been called into question under contemporary circumstances, where often imported drugs cannot be obtained and a preventative approach may be more cost-effective than the old-fashioned emphasis on only curative medicines. The same array of issues which apply towards health care delivery for human populations are equally applicable to livestock. We are likely to see increasing discussion of "barefoot" veterinarians, accompanied by analysis of the role of different service components in an overall system. It seems apparent that the resulting service delivery system is not (contrary to the image held by many livestock officials) subject to centralized control, being instead what might be termed a "loosely coupled" system. How to obtain coordinated action and how to

recover service costs in such networks remain unresolved, but could be an interesting area for comparative research. In regard to semi-nomadic pastoralists, the extensive nature of production and the small human populations served at any one site are obvious constraints which were insufficiently recognized in the past. The match-up with other social services (security, health, and education) and with herd management practices (transhumance, reserved grazing, etc.) should be pursued further.

6. To correctly identify promising interventions is perhaps the single most important step which can occur in the evolution of a rural development project. As David Korten has pointed out, most successful projects go through an initial learning phase before stumbling upon a particular package of measures which can be replicated more widely (Korten 1980). And yet this initial stage is taken for granted under the usual, economic appraisal approach adopted by donors. How the package is discovered and refined is not specified. Instead, donors employ an elaborate (and often misleading) set of procedures to weigh anticipated costs and benefits, adjusting their assumptions until an apparently adequate rate of return can be obtained. The imbalance between the scant regard given to how interventions are identified in contrast to a large effort devoted to forward guessing their likely results is striking.

What one can say is that neither "system describing" nor basic "components research" are likely to generate useful suggestions for project intervention. Basic scientific research employs evaluative criteria aimed at verifying conclusively the scientist's research hypotheses. It does not (as many critics of the experimental research paradigm have pointed out) tell how the hypotheses are developed in the first instance. Because of the long generation time and high costs of maintaining large animals, livestock research tends to be expensive and slow. It has not been notable for generating new ideas suited to actual production systems. On the other hand, simply describing the larger ecological and socioeconomic systems does not generate such ideas, either.

There are fairly obvious reasons for the low productivity of research which starts at either the "components" or the "environmental" extreme (the two recognised bases from which scientific information has been derived in the past). Research on individual components suffers from the high interactions between factors, the unsuitability of many introduced components under tropical conditions, "layered obstacles" (additional constraints which emerge when the initial ones are relaxed), and the marked difference in production conditions on research stations from those encountered by producers.

Research on environmental vectors, however, also meets with severe problems. The high variability in key factors, the huge array of potentially significant variables, the masking effects of seasonality and impoverished soils, the large degrees of institutional uncertainty seen in poor countries, and the many possible species and technological options all must be dealt with. Unless given some structure and direction, environment describing research (which is research, though not necessarily experimental in its orientation) can dissipate scientists' attention over a huge and complex array of potentially interesting factors. It, too, lacks a methodology for deciding upon priorities. An added difficulty was that until recently little thought was given about how learning can be transferred from one type of system into similar but not identical environments (here see ILCA's attempt to extend its highland Ethiopian results into other parts of East Africa). Thus the general disillusionment felt in some quarters about the low productivity of "system describing" research in parts of Africa was based on actual experience. While much research of this nature was done in the decade between 1975 and 1985, few technological interventions emerged which were suited for incorporation into improved production systems.

Perhaps other research organisations could learn from ILCA's recent research experience. ILCA's Africa programme was at first oriented towards systems-describing objectives, dividing up the continent's livestock problems according to zonal domains. Of ILCA's zonal research programs, one (studying the Kenya rangelands) aimed at documenting an institutional intervention, the establishment of group

ranches in Kenya's Maasailand. Five years later (and a decade after the policy was adopted) ILCA's research shows the innovation itself did not bring the anticipated benefits (Evangelou 1984). Negative results do represent a scientific contribution, but they do not delineate useful policy options (a task for which a scientific approach uninformed by technological imagination is unsuited).

In ILCA's other zones -- the Ethiopian rangelands, the semi-arid Sahel, the Sub-humid zone, and the West African humid zone-- there were no commitments initially to particular interventions, and indeed, none have emerged to date for the Sahel program centered in Mali and Niger. In Nigeria, however, ILCA's field research teams started at what would be the middle stage if one had instead begun with basic, scientific research. While describing the larger environment, field teams undertook a rapid screening of possible interventions which farmers found attractive (von Kaufmann 1983). This led to the concept of "fodder banks" for the sub-humid zone, and "alley farming" for the forest areas (Sumberg 1984).

Once the intervention was identified, intensive work was directed at measuring relevant parameters and creating a base of empirically-tested information -- in effect directing research both downwards to the individual components and upwards into the generation of system-describing information. The key advantages which starting in the middle confers are, of course, that researchers gain rapid feedback to learn what farmers consider important, while obtaining a means for deciding which components merit priority attention. Adequate technical research increases the field team's understanding of their chosen intervention, even as they move into extending the concept to new settings and wider application.

7. The influence of environmental constraints, principally strong seasonality but also the depleted nutrient status of soils and other situational limitations emerge clearly from recent studies. Ecological studies of East African pastoralism seem to show similar levels of productivity at different sites which share roughly the same rainfall regime (Coughenour, et al. 1985:622, de Leeuw, 1986). As

Price (1981) argues, wildlife living under seasonal extremes in the tropics show adaptations similar to those exhibited by livestock kept by pastoralists. It makes sense to have hardy, light animals which can trek long distances without losing condition, which utilize less water than heavier breeds, and which respond rapidly whenever constraints are relaxed. The marked shortages of forage and water at the height of the dry season undermine many otherwise promising technical interventions (though of course this may not be as evident in a research station setting where official recommendations get formulated). Coping with seasonality, then, represents the primary imperative facing producers (Swift, 1981). If so, analysis of how various systems (and interventions) alleviate the influence of seasonality would appear to be a useful starting point for future work.

Less well understood, however, is the fact that the moisture constraint is only the uppermost of several further limiting factors in the system (Penning de Vriër and Djitéye, 1982). When moisture constraints are relaxed, shortages of nitrogen (N) become limiting, and when these are supplied, shortages of phosphorus (P) become critical. Any approach which deals with only one factor risks being ineffective. We might characterize this as a system constrained by "layered obstacles": removal of one constraint simply brings to the fore another one, whose influence was masked at an earlier stage by the more evident factor. The choice of interventions for such systems becomes extraordinarily difficult. What will be required is a sequential response matched to the particular resource endowments in the local system.

A closely analogous situation applies in the economic sphere. Seasonal shifts in the terms of trade frequently undermine the influence of desirable policies, making it impossible for pastoralists to realize an economic return from "improved" husbandry (O'Leary 1984). The implementation of individual improvements, such as reliable water points or a network of livestock marketplaces, may relieve one problem only to reveal the simultaneous presence of another equally limiting factor. Having livestock markets will be of little assistance if the national transportation system breaks down or

if traders lose their confidence in the national currency. The deteriorating national economic situation in many African countries exerts a strong, negative influence on a range of livestock policy measures. Often producers cannot buy imported drugs, dipping regimes are no longer followed because of a shortage of acaricides, and field staff lack the fuel and vehicles to remain mobile. These factors are just as real as are shortages of nitrogen or soil moisture: they indicate a tightening of constraints upon overall livestock productivity. We can conclude that a multi-pronged, multi-disciplinary perspective is even more essential in African livestock production today than it may have been a decade ago when "systems" studies were more in vogue.

8. The Sahel conundrum continues to exert its fascination upon analysts, and continues to frustrate the attempts by donors and national governments to stimulate livestock development in the semi-arid zone of Africa. The declining average trend in rainfall and forage productivity over vast areas of the Sahel continues unabated. The droughts of 1972-73 and of 1983-84 represent only extreme events within a larger scenario of drier years, made more evident by the fact that the 1950s and 1960s experienced a wetter than average trend (Nicholson, 1984). There are short-term "solutions" based upon better distribution of grazing (perhaps managed by producers' associations rather than by bureaucratic outsiders), or re-equipping pastoralists after drought. But technical experts are divided over the larger issue of whether in the long run the Sahel can, in fact, support its present livestock and human populations. Syntheses of technical research from the zone -- notably by Penning de Vries, de Ridder, and Wilson -- document the severity of the constraints, but leave uncertain whether effective technical interventions yet exist. Of course, if a much lower stocking density were feasible and people did not utilize livestock products for food, a less damaging production system might be instituted (copying the commercialized beef ranching of Texas or Australia). However, the alternative systems would have a lower biomass per hectare and a lower human carrying capacity, making them far less attractive as a means of supporting the region's present populations. Hot controversy still exists among well informed obser-

vers whether the range manager's ideal of a thinly stocked, commercialized ranching operation is what Sahelian governments should aim to create, or whether there are as yet untapped biological potentials (such as livelihood based upon camels and small ruminants) which might be instituted in this zone. What is certain is that under increasingly dry conditions, the ecological balance established in the wetter years has been seriously (and perhaps permanently) disrupted. Finding a different production system suited to Sahelian conditions remains a top priority item on the agenda for current African research.

9. Recovery after drought continues to be of central interest to donors and national governments alike, especially within Africa but also in parts of Latin America affected by the El Nino event of 1983. Toulmin (1986) has reviewed (for ILCA's ALPAN network) the policy options available to African governments. It can be argued that several of the more common responses to drought, such as the establishment of expensive small-scale irrigation schemes (discussed below under item 14), are less cost-effective than it would have been to provide destitute pastoralists with replacement animals to re-enter the semi-pastoral economy (see earlier network papers by Cynthia White and Richard Hogg). When drought returned to the Sahel in 1983 and 1984, it would have been very useful to have had access to detailed analysis of the cost-effectiveness of the various recovery measures implemented after the 1972-73 drought.

The post-drought period has seldom been adequately studied in relation to the emergency measures adopted during the drought. The key policy issue is how to get households out of a situation of continuing dependency as rapidly and cheaply as possible. It is ironic that while we have good documentation on declining production trends as the 1983-84 drought intensified, the extreme conditions brought about a cessation of field observation which might have documented recovery. It seems that scientists have missed opportunities to document the resiliency of various systems after a drought is past. Rates of recovery seem to vary between environments, and within environments between species (camels vs. cattle vs. smallstock). The immediate post drought period

is the time when highly stressed animals may die, even though suddenly water and grass are again abundant. Where a large proportion of ex-pastoral households live in famine relief camps, there is also the question of how best to train people to re-enter semi-nomadic production, and the issue of whether or not such activities are "doomed" to eventual failure because of increasingly monetized production and vulnerability to future droughts. Often the immediate effect of drought is to strip pastoralists of their capital assets, so that even when they do begin herding again, they may do so as the clients of absentee owners rather than as independent producers. Cossins (1983:220) notes also that the changed herd structure caused by severe drought will continue to influence production for a number of years afterwards, even during good seasons.

10. How to translate the superior biological adaptations of small ruminants, camelids, and yaks under demanding environmental conditions (whether in the Sahel, the high Andes, or in Tibet) into an economically attractive form is still problematic. There are many studies suggesting that modes of livelihood based on these other species not normally dealt with under western animal science have rarely been successfully commercialized. Of course, trade in camel's meat was a major but short term outlet in parts of North Africa and the mid-East, when camels were being superceded by trucks in the desert. The fact remains that in a larger, international economy, the output from goats, camels, and other exotic species have little commercial value. This limited demand for unconventional species in a modern economic system contrasts with the high utility such animals had traditionally, where their superior biological adaptation was the key consideration. Nowadays, scientific research is finally being launched to investigate factors related to the productivity of small ruminants, and -- though to a lesser extent -- of camelids (Wilson, et al. 1985). Nonetheless, the effective take-up of such technical findings will depend upon whether traditional production can be monetized without destroying the system itself. The people who might use traditional livestock products from goats and camels are usually marginal to the modern economic system, and have little buying power within it. Sometimes such stock fall under the woman's control in the household, contributing

significantly to household well-being but neglected by the senior males who may control the group's cash income. This makes it unlikely that we can expect a demand-led development of nonconventional livestock products like alpaca hair or goats' milk, despite the higher biological productivity of these species in harsh environments (Browman 1983).

11. Labour and herding strategies emerge as key considerations affecting pastoral household decision-making (Grandin 1983, Paine 1972). Their importance may have been overlooked by non-anthropologists until recently because of their relatively static contribution in livestock systems where animals are confined by fences. In pastoral systems, to the contrary, a household's ability to split its herds (by species, gender and age) depends heavily upon its labour force and herding arrangements. The quality of herders' skill may have a large influence on survival rates for particular categories of stock. The stamina shown by herders (and by those left behind) may determine what water supplies can be used and how widely the livestock can be grazed.

As is by now well known (Dahl and Hjort 1976, Dahl 1979:68-87), the size of the labour force and of the herd must be kept in balance as a compound and its animals increase. Nevertheless, until studies done in the last decade little attention was paid to the strategies by which households accomplished this objective (Sperling 1985, Torry 1977). Even households with a quite similar herd structure may utilise quite distinct herding strategies with very different ecological and economic consequences. It seems obvious that the earlier notion of "pastoral conservatism" describes pastoralists reluctant to sell breeding animals, but does not accurately identify the underlying strategies (Cossins 1983).

Ethnographic studies by anthropologists indicate that in many systems herders are rewarded by allowing them access to milk and to progeny, rather than by cash payment. The tradition of reciprocity means that real income is often more widely shared than is livestock ownership, at least within systems which have not yet experienced commer-

cialization. The entry of livestock into a commercial system emphasizing end sale rather than continuing utilization can make a dramatic change in herders' livelihood, superceding earlier forms of entitlement which were based on the subsistence use of animals. In addition the withdrawal of adolescent children to attend school diminishes the household labour force and may particularly affect how calves are tended. This transition will not be evident from a mere inspection of pastoralists' herds.

Ensminger (1985) has documented the decreased viability of Kenya's Orma pastoralists under a situation of rapid commercialization, just as O'Leary (1984) describes for the Rendille. One has only to see what happened to the Skolt Laplanders' production system (traditionally based on reindeer herding) in only a few seasons to become aware of the dangers (Pelto 1973).

12. Decision-making among semi-nomadic households needs to be investigated empirically, rather than deductively (as in economics) or retrospectively (as in traditional anthropology). As Fry and McCabe (network paper 22b) argue, macro surveys tend to delineate an oversimplified, schematic picture of movement patterns. When tested by incorporation into policy advice, schematic diagrams of grazing movements (typically shown by boldface arrows superimposed on a map) usually turn out to have little predictive value (Dyson-Hudson 1972). Actual movements observed at the micro level reflect the changing matrix of proximate circumstances: a herder's labour availability; the current status of food, water, and disease; the threat of raiding; the herder's past experience and personal knowledge; the disposition of famine relief; and so forth.

In the past, attempts to represent producers' decision-making relied heavily upon linear optimization employing an input-output model; or else utilized a monthly, farm budgetting approach. Neither approach was suited to analysis of the type of sequential and dynamic decision-making over the course of a season which is exhibited by African pastoralists. How herding decisions are actually reached could be studied more effectively (though requiring intensive coverage) by iden-

tifying the hierarchy of producers' perceived constraints, along lines pioneered by Gladwin (1984) and Barlett (1980). What is essential in such analysis is to focus on the information available to producers at the time when decisions are made. Research is needed to document both what alerts herders to a need for reconsideration of earlier decisions, and what circumscribes the options they will consider at a given juncture. It is also obvious that there will be linkages between earlier and later decisions: a commitment to migrate, for example, will change the matrix of possibilities. Because of the many permutations and events which are potentially significant, the path of a producer's actual decisions taken over a season can rarely be predicted from the initial state of resources.

It seems likely the production objectives, options and strategies differ quite markedly between producers even when they are part of a common cultural tradition (Garrett 1986). The size and composition of herds, as well as of the available labour force, will have a large influence upon herd management decisions (de Leeuw, et al. 1984). An understanding how these variables interact within different socio-economic strata could greatly improve the ability to predict responses to proposed policy measures directed at livestock producers.

13. One consideration which many pastoralists cannot afford to ignore is the degree of security which obtains in areas they intend to use. An adverse trend over much of Africa has been the militarization of rural life, either directly (through involving ex-pastoralists as fighters) or indirectly (increased threats from elsewhere). The area of the continent being contested militarily has again widened in recent years, leaving in its wake turbulent local conditions which exacerbate the underlying riskiness of production. Even when armed forces leave an area, some of their weapons stay behind to become the basis for banditry and organized raiding. Producers may lose their livestock or their lives, and during times of trouble may find themselves cut off from external famine relief upon which many ex-pastoral households now depend. Some grazing lands located in borderlands between rival groups have become too insecure for pastoral use, and have reverted to bushland (Conant 1982). The point is that a militarization of African

rural life can be an enormously destabilizing influence, which particularly affects measures for modernizing livestock production such as rotational grazing, stockroutes, and orderly livestock marketing.

14. Then, there is the question whether irrigation for pastoralists constitutes a viable alternative to their present ways of life. For obvious reasons, many of Africa's larger irrigation systems have been located in semi-arid lands which had been mainly used by pastoralists. Few of these schemes, whether the Office du Niger in Mali, Khashm el Girba in Sudan, or Perkerra in Kenya, were successful in recruiting pastoralists to become scheme members. Then, after the droughts of the early and late 1970s, small-scale irrigation projects were introduced into very dry areas like Turkana in Kenya as a means for reducing the dependency upon external sources of food (Shwarz, 1983). Small, pump-based irrigation schemes have been sponsored by NGOs in famine relief areas once the immediate threat of a drought had passed.

In retrospect, there should have been little reason to expect lasting success. Almost by definition, such projects tend to be placed in remote areas with poor access to supplies of fuel and parts. By the same token, they lack access to markets and must concentrate upon subsistence production for their members: a valuable contribution, but not one for which members can pay. Then, too, the concentration of population required for even a small scheme quickly destroys the fuelwood supply in the surrounding area -- a visible and unintended ecological consequence on most such schemes. Where the menfolk are away fighting or seeking work, schemes may contain mostly women and their dependents: hardly a viable labour force. All in all, most small-scale irrigation projects for pastoralists have been very expensive; few would be viable without a continuing NGO presence.

This leaves unexamined the larger question why, in an African context, there is relatively little integration between the irrigated and livestock producing sectors of the economy. The semi-arid areas where irrigation is attractive are also usually a country's main zone for livestock production. In developed nations, linkages between the two

forms of agriculture occur spontaneously; irrigated production of forage is common. In Africa, instead, irrigation managers tend to see livestock producers as a "problem": to be excluded by law from utilizing the very water and pastures which were theirs before irrigation was established (Moris and Thom 1985). This suggests that African livestock production has been monetized in a perverse fashion, which cuts the links between producers and the natural resources they require.

15. Finally, we have the issue of sedentarization (Galaty et al. 1981). Most African governments persist in hoping that pastoralists can be sedentarized as quickly as possible, making them amenable to the types of service delivery system used for dealing with settled agriculturalists. Several of the themes already touched upon reappear in regard to this objective: the question of trends in use of common property resources, the design of new grazing systems suited to more intensive exploitation of range resources, and the identification of technical interventions which circumvent constraints which presently penalize those who remain permanently in one place. For let there be no misunderstanding about it. Technical research to date indicates that, in the words of the Wageningen team "replacing nomadism and transhumance by sedentarism will have a very negative effect on animal productivity" (Penning de Vries and Djitéye, 1982:507).

Nonetheless, either because of relocation of people into famine-relief camps, a collapse of the commons under uncontrolled individuation of landholdings, or because of security needs, many ex-pastoralists are settling permanently around small trading centres dotted across the landscape. In so doing, problems of disease, overexploitation of range resources, and increased vulnerability to drought must be overcome. How to minimize these adverse impacts without leaving ex-pastoralists heavily dependent on unreliable outside sources of food and income is as yet unclear, although this process is already well advanced in North Africa and the Mid-East (see various cases contained in Salzman, 1980). The agro-pastoral component is likely to assume increasing importance in future studies, since (as in Nigeria) many ex-pastoralists are beginning to settle and to grow crops as well

as keeping cattle.

CONCLUSION

The arguments reviewed here have been stated in a somewhat contentious fashion, to provoke commentary, rebuttal, and further work. The purpose of this network is to stimulate exchanges of ideas and experience between people sometimes working in quite isolated settings. The network will be happy to publish members' views on any points relating to pastoral development.

There are, however, some general conclusions suggested by this brief overview of directions in research and policy. It does seem that the components in the systems we are dealing with are interconnected and interactive. Systems of this kind are likely to be resistant to planned control, since any single initiative may be counteracted by an array of interlinked factors and conditions. Where many of the trends are negative, as at present (with drought, militarization, and economic deterioration all overlaid upon each other), even sensible and necessary policies may fail to show any impact.

On the positive side, there are hints of a coming "paradigm shift" based on a more accurate knowledge of the constituent systems. It is time to move away from simplistic, deductive arguments based upon concepts of the "tragedy of the commons" and "carrying capacity" towards more differentiated analysis of individual systems. The deductive arguments which predominated in past analysis apply everywhere: they are at the same time powerful and trivial, since they fail to discriminate between situations encountered at the local level, and policies based upon them have been totally ineffective. Better ways of measuring performance and of understanding how local systems actually work are at hand, though some of us may find it painful and difficult to reformulate our accustomed analytic frameworks. At long last, field research of a multi-disciplinary nature is beginning to document the critical factors which account for the persistence of semi-nomadic pastoralism under adverse conditions.

Having made this observation, it remains true that we have not learned yet where leverage should be applied to move systems in a more desired direction. The vulnerability of African pastoralism under extreme conditions was again exhibited in the droughts of 1983 and 1984, which drove many households back into famine relief and which sometimes afflicted the same areas devastated by the 1972-73 drought. It is apparent that government agencies and external donors have few new technological interventions to offer. Irrigation from small-scale supplies in remote locations has not been a cost-effective answer. It is perhaps time to admit that the scientific world has no apparent solution which would permit continued occupation of overstressed, Sahelian lands at present population levels. Meanwhile, the creation of external dependency linked to distribution of famine relief continues. It serves as a warning that unless better options are discovered soon, there may be no viable economy into which African pastoralists can be reintegrated.

REFERENCES

- Barlett, Peggy (ed.) (1980) Agricultural Decision-Making. New York: Academic Press.
- Behnke, Roy (1985) "Measuring the Benefits of Subsistence Versus Commercial Livestock Production in Africa," Agricultural Systems, vol. 16, pp. 109-135.
- Browman, David (1983) "Andean Arid Lands Pastoralism and Development," Mountain Research and Development, vol. 3, no. 3, pp.241-252.
- Conant, F. (1982) "Thorns Paired, Sharply Recurved," In, Spooner, B. and Mann, H.S. (eds.) Desertification and Development. New York: Academic Press.
- Cossins, Noel (1983) "Production Strategies and Pastoral Man," pp.213-231. In, ILCA, Pastoral Systems Research in Sub-Saharan Africa. Addis Ababa: ILCA.
- Cossins, Noel (1985) "The Productivity and Potential of Pastoral Systems," ILCA Bulletin, no. 21 (January), pp. 10-15.

- Coughenour, M.B. et al. (1985) "Energy Extraction and Use in a Nomadic Pastoral Ecosystem," Science, vol. 230, no. 4726, pp.619-625.
- Dahl, Gudrun and Hjort, A. (1976) Having Herds. Stockholm: Dept of Social Anthropology, University of Stockholm.
- Dahl, Gudrun (1979) Suffering Grass. Stockholm: Dept of Social Anthropology, University of Stockholm.
- de Leeuw, P., et al. (1984) "Aspects of Livestock Productivity in Maasai Group Ranches in Kenya," ILCA Bulletin, no. 19 (July), pp. 17-20
- de Leeuw, P. and Milligan, K. (1983) "Integration of Remote Sensing Techniques for Resource Evaluation in Pastoral Systems Research," pp. 57-76. In ILCA, Pastoral Systems Research in Sub-Saharan Africa. Addis Ababa: ILCA.
- de Leeuw, P. (1986) "A comparison of Cattle Productivity in Five Traditional Livestock Systems in Sub Saharan Africa." Paper for the 3rd International DLG Symposium on Animal Production Alternatives in Ruminant Livestock Production in North Africa and the Middle East. Gosler, Federal Republic of Germany.
- de Ridder, N., et al. (1982) Productivity of Sahelian Rangelands. PPS Course Book, 2 vols. Wageningen: Dept. of Soil Science and Plant Nutrition, Wageningen Agricultural University.
- de Vries, F.W.T. Penning and Djitèye, M.A. (eds.) (1982) La productivité des pâturages sahéliens. Wageningen: Centre for Agricultural Publishing and Documentation, PUDOC.
- Dyson-Hudson, Rada (1972) "Pastoralism: Self Image and Behavioral Reality," pp.30-47. In, Irons, W. and Dyson-Hudson, N. (eds.) Perspectives on Nomadism. Leiden: E.J. Brill.
- Ensminger, Jean (1985) "The Commercialization of Pastoralists" Paper for the Workshop on Seasonal Causes of Household Food Insecurity, Policy Implementation and Research Needs. Washington, D.C.: IFPRI.
- Evangelou, Phyllo (1984) Livestock Development in Kenya's Maasailand. Boulder, Colorado: Westview Press.

- Fielding, D. (1986) "Livestock Performance -- Getting the Terms Right," Agricultural International, vol. 38, no. 4 (April), pp.120-121.
- Francis, Paul (1986) "Land Nationalisation and Rural Land Tenure in Southwest Nigeria," ILCA Bulletin, no. 24 (March), pp.2-7.
- Galaty, John, et al. (eds.) (1981) The Future of Pastoral Peoples. Ottawa: IDRC.
- Garrett, Patricia (1986) "Viable Objectives for Smallholder Programs: Variation by Social Strata," Agricultural Administration, vol. 22, pp. 39-55.
- Gladwin, Christina, et al. (1984) "Using Ethno-scientific Tools to Understand Farmers Plans, Goals and Decisions," pp. 27-40. In, Malton, P., et al. (eds.) Coming Full Circle. Ottawa: IDRC.
- Grandin, Barbara (1983) "Labour Data Collection," pp. 305-316. In, ILCA, Pastoral Systems Research in Sub-Saharan Africa. Addis Ababa: ILCA.
- Henricksen, B.J. (1986) "Determination of Agro-ecological Zones in Africa: ILCA Activities and Expectations," ILCA Bulletin, no.23 (January), pp. 15-22.
- ILCA (1983) Pastoral Systems Research in Sub-Saharan Africa. Addis Ababa: ILCA.
- Jodha, N.S. (1985) "Population Growth and Decline of Common Property Resources in Rajasthan, India," Population and Development Review, vol. 11, no. 2, pp. 247-264.
- Korten, David (1980) "Community Organization and Rural Development, A Learning Process Approach," The Public Administration Review, vol. 40, no. 5, pp. 481-511.
- Moris, Jon (1981) "A Case in Rural Development: The Masai Range Development Project," pp. 99-113. In, Managing Induced Rural Development. Bloomington, Indiana: International Development Institute.

- Moris, Jon and Thom, Derrick (1985) African Irrigation Overview, Summary. WMS Report 37. Logan, Utah: Agricultural and Irrigation Engineering, Utah State University.
- Nicholson, Sharon (1984) "The Climatology of Sub-Saharan Africa," pp. 71-92. In, National Research Council, Environmental Change in the West Africa Sahel. Washington, D.C.: National Academy Press.
- O'Leary, Michael (1984) "Ecological Villains or Economic Victims: the Case of the Rendile of Northern Kenya," Desertification Control Bulletin, no. 11 (December), pp. 1-17.
- Oxby, Claire (1981) Group Ranches in Africa. Rome: FAO.
- Paine, Robert (1972) "The Herd Management of Lapp Reindeer Pastoralists," pp. 76-87. In, Irons, W. and Dyson-Hudson, N. (eds.) Perspectives on Nomadism. Leiden: E.J. Brill.
- Pelto, Pertti (1973) The Snowmobile Revolution. Menlo Park, California: Cummings Publishing Co.
- Peters, Pauline (1985) Embedded Systems and Rooted Models: The Grazing Lands of Botswana and the 'Commons' Debate. Development Discussion Paper No. 203. Cambridge, MA: Harvard Institute for International Development.
- Price, Mark R. Stanley (1981) "The Rangelands: Pastoralism and Ranching," pp. 150-175. In, Campbell, David and Migot-Adholla, S.E. (eds.) The Development of Kenya's Semi-Arid Lands. IDS Occasional Papers, No. 36. Nairobi: Institute for Development Studies, University of Nairobi.
- Salzman, Philip (ed.) (1980) When Nomads Settle. New York Praeger.
- Sanford, S. (1977) "Pastoral Planners' Needs for Anthropological Data," pp. 29-40. In, ILCA, East African Pastoralism, Anthropological Perspectives and Development Needs. Addis Ababa: ILCA.
- Schwarz, Sabine (1983) "Irrigation in Arid Areas its Limitations and its Rejection by Nomadic Pastoralists," pp.191-212. In, Man and Technology in Irrigated Agriculture. Hamburg: Verlag Paul Parey.

- Sperling Louise (1985) "Labour Recruitment Among the Samburu of Kenya," LABOUR, Capital and Society, vol. 18 no. 1 (April), pp. 69-86.
- Sumberg, J.E. (1984) "Alley Farming in the Humid Zone: Linking Crop and Livestock Production," ILCA Bulletin, no. 18 (April), pp.2-6.
- Swift, Jeremy (1981) "Labour and Subsistence in a Pastoral Economy," pp. 80-87. In, Chambers, Robert, et al. (eds.) Seasonal Dimensions to Rural Poverty. London: Frances Pinter.
- Torry, W.I. (1977) "Labour Requirements Among the Gabra," pp. 159-169. In, ILCA, East African Pastoralism, Anthropological Perspectives and Development Needs. Addis Ababa: ILCA.
- Toulmin, Camilla (1986) Pastoral Livestock Losses and Post-Drought Rehabilitation in Subsaharan Africa: Policy Options and Issues. ALPAN Network Paper, no. 8, Addis Ababa: ILCA.
- von Kaufmann, R. (1983) "Design and Testing Procedures in Livestock Systems Research: An Agro-Pastoral Example," pp. 407-425. In, ILCA, Pastoral Systems Research in Sub-Saharan Africa. Addis Ababa: ILCA.
- Wilson, R.T. et al. (eds.) (1983) Recherches sur les systèmes des zones arides du Mali: résultats préliminaires, Addis Ababa: ILCA.
- Wilson, R. T. et al. (1985) "Mixed herding and the demographic parameters of domestic animals in arid and semi-arid zones of tropical Africa," pp. 116-138. In, Hill, Alan G. (ed.) Population, Health and Nutrition in the Sahel. London: KPI Ltd.